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Joint Composite Tracking Network (JCTN)- Benefits to Cruise Missile Defense

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Title of Document Joint Composite Tracking Network (JCTN) Benefits to Cruise Missile Defense

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JOINT COMPOSITE TRACKING NETWORK (JCTN) BENEFITS TO CRUISE MISSILE DEFENSE

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ABSTRACT. The Joint Composite Tracking Network (JCTN) concept was developed as a network of sensors that would enable substantial improvements in operational capabilities including the ability to track and destroy cruise missiles. Although it includes a communications element, JCTN is more than a communications network. JCTN is a value-added processing system that includes common software to share and fuse data from participating sensors to create a highly accurate integrated aerospace picture.

JCTN Benefits to Theater Air and Missile Defense. The JCTN study showed that a Composite Tracking Network could provide an accurate, resolved, consistent (operationally identical) real-time Air and TBM picture because: (1) the same sensor data are processed virtually identically and simultaneously by all participants and (2) because joint composite tracking provides better track accuracy, and track continuity, as well as common track numbers. This is achieved primarily because the fusion of data from different sensors provides viewing angle and frequency diversity.

JCTN improves battlespace (defense in depth) in four ways:

(1) It increases decision time since composite tracking with data fusion provides accurate information earlier.

(2) It enables earlier weapon commit (interceptor launch) by making gridlocked data from quality forward sensors available to the weapon systems and by converging tracks faster to achieve engagement quality track accuracy.

(3) It permits systems to engage on remote information if one viewing sensor is of fire control quality, or if the composite track by multiple sensors is of fire control quality. In this way a weapon system can guide an interceptor on the remote/composite track data even when its own sensor is not tracking the target.

(4) The JCTN also enables extension of the battlespace to regions outside the fire control uplink coverage of the parent firing unit (e.g., azimuth limits of its uplink antenna) by supporting shift in interceptor control to another suitable firing unit (this concept is sometimes called "forward pass.").

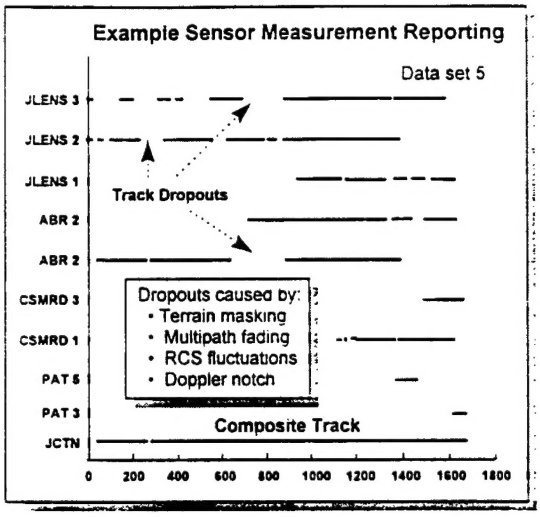
JTAMD Operational Concepts. As defined in the JTAMD Master Plan, the operational concept for JTAMD consists of four mutually supporting objectives: (1) creation of a Single Integrated Air Picture (SIAP); (2) early detection, classification, and identification of all objects in the aerospace surveillance volume; (3) defense in depth; and (4) 360 degree coverage. Many of the JCTN benefits just discussed directly contribute to these four objectives, as well as contributing to new battle management concepts.

The objective to achieve a SIAP is supported by the JCTN's ability to bring together multiple sensor detection measurements and fuse them into an accurate, resolved, consistent (operationally identical) real-time air and TBM picture. The JCTN contributes to early detection, classification, and identification in a number of ways. Early detection is enhanced by the JCTN's ability to achieve joint sensor support coordination. JCTN contributes to classification and identification through composite resolution for more accurate raid counts. This enhanced SIAP is an enabler for new CONOPS and new forms of battle management including: (1) execution of joint engagement zones (JEZ), (2) air-directed surface-to-air missile (ADSAM), (3) air-directed air-to-air missile (ADAAM), (4) more effective and efficient joint engagement assignment methodologies, and (5) joint sensor coordination.

In many situations, the JCTN provides 360 degree coverage as a result of merging all participating systems/platforms' information in theater. This is particularly important for weapons systems that are directional, or are placed in pronounced terrain where sensor coverage is restricted.

For weapon systems that are able to shift interceptor control to another unit, the JCTN could enable intercept outside the fire control

uplink coverage of the parent firing unit extending the effective battlespace to the kinematic range of the weapon. In the aggregate, this provides for an improved defense in depth capability for the active air defense force structure.



Technical Feasibility Analyses. The operational benefits analyses assumed certain degrees of quality (accuracy, timeliness, and CID confidence) in the SIAP. Thus a set of analyses were performed to assess the likelihood that technical feasibility and performance requirements could be met with or without JCTN. These took two forms: (a) analyses of the mathematical and engineering feasibility of achieving needed technical performance (e.g., gridlock, association, timing, jamming resistance, communications load throughput, filter precision, security architecture) and (b) assessment of the requirements demanded by each weapon system in order to derive benefit (latency, update rates, track accuracy, interceptor seeker handover error basket size). In addition, concepts of active sensor management for JCTN were defined to see if the quality of the SIAP could be improved while minimizing sensor resource demands. Also, a concept of adaptive sensor reporting was analyzed to see if the SIAP quality would be adequate to support the momentary fire control quality needs of users, including the idea of "engagement support requests" from weapons systems.

Conclusions. The goals of the JCTN Phase 2 Study have been met. The study concluded that a JCTN concept that meets the JTAMD objectives can be defined and is technically feasible. The analyses demonstrated numerous benefits for cruise missile and air defense, and similarly for TBM defense sufficient to justify the continued development and demonstration of a JCTN joint force capability. The analyses tested the thesis that JCTN could improve the SIAP, enhance coordination among TAMD weapons, and enable advanced battle management and cooperative engagement concepts. The study confirmed the thesis. In addition, during the conduct of the study it became clear that JCTN, albeit a key element, is but one element, and all elements must progress in balance to achieve the desired goals envisioned in the JTAMD Master Plan. Included in this partnership are the need to define operational concepts for joint TAMD to exploit the potential offered by JCTN. The ABR and JLENS platforms were shown to be high value to the CM defense mission, and should proceed in parallel with JCTN development. JDN improvements are critical to the high quality SIAP, and serve as the workhorse for distributing the JCTN-based SIAP to the larger warfighting community. It is essential for the SIAP to contain available theater and national information on the objects in the aerospace picture (including things which impact rules of engagement (ROE) decisions, such as the point of origin or detection of a track and its intentions). This requires a redoubling of effort to share, integrate, fuse, and associate the combat identification and tactical intelligence information with the SIAP.

Finally, JCTN and JDN should not proceed independently. These two systems are mutually supporting and their development and evolution needs to be closely coupled.

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